Saimaa University of Applied Sciences
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USING CASE BASED REASONING TO SUPPORT STRATEGIC MANAGEMENT

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ABSTRACT
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Real life practice in management reveals that every company needs a strategic management expert who can help the company to realize its goals, but the market does not have such a number of experts to serve those companies. In this case, artificial intelligence could help to support managers in companies to make strategic decisions. In real life, humans learn from past experiences that happened with them or with others.

Case based reasoning (CBR) was selected as a way to support decisions in strategic management for companies based on previous experiences gained by other successful companies with similar domain fields, structures, and financial performances. The work includes developing a mathematical model to correlate company cases as well as implementation software which is able to suggest to companies suitable strategies.

The research work has faced some difficulties in finding an adequate number of strategic data from real companies in certain domain fields such as retailing business, the field that was selected for testing the model. The problem is that each company tries to hide its current strategy, but hypothetical data were selected which could be considered to be real as a solution for that problem. All that needs to be done in real life is to replace this hypothetical data with real data.

Keywords: Strategic Management, Case Based Reasoning, Strategic Management Decision Support System

CONTENTS

1. INTRODUCTION

1.1 Background

It has been noticed that in recent years the strategic management process has become more complex and costly. That is due to the growing competitiveness in many markets along with the increase in the dimensionality of the business domain which increased the difficulties faced by managers to make correct decisions. Therefore, in order to assist managers to make strategic decisions for their companies, a wide variety of tools and techniques have been developed. (Strategic Management Tools and Techniques.)

Because of the need to search for relevant strategies, a wide range of conceptual tools or techniques have been developed for these purposes. These tools and techniques are related but distinct. Managers must decide on the extent to which they will be involved in strategic and operational decision making process. (Strategic Management Tools and Techniques.)

There are several strategic management tools and the most widely used tools are critical question analysis, gap analysis, industry analysis, product-market matrix, product life cycles, and many analytical frameworks used in portfolio management (e.g., SWOT analysis) (Strategic Management Tools and Techniques).

Surma has chosen case based reasoning as a suitable decision making paradigm. He presented the STRATEGOS case-based reasoning system for supporting strategic decision making by SME management board. (Surma 2009.)

1.2 Work summary description

It can be seen in life that business leaders often use analogies when faced with a complex problem. They try to compare current the situation to similar situations or circumstances from their past or the history of other organizations, and deduce certain lessons from those experiences (Roberto 2003, pp. 1-2). It can be seen that analogies can play an important role in human thinking, in many areas such as problem solving, decision making, explanation, and linguistic communication. Humans make computational models to simulate how to retrieve and map source analogs in order to apply them to target situations (Cognitive Science). It can be seen that reasoning by analogy is a common form of logic among business strategists. Usually when people are facing a novel opportunity or predicament, strategists immediately think back and try to find some similar situations they have faced or heard that others faced, and then they try to use the lessons learned from that previous experience. So analogies to the past or to other firms or industries always come up frequently in strategy discussions. (Gavetti, Rivkin, Daniel 2005, p. 5.)

During the past period there were several trials to use different artificial intelligence techniques to serve businesses. Here I will discuss using one artificial intelligence technique to suggest to managers strategies for their companies, based on previous experience implemented by companies in the same domain field with the closest similar structure and financial performances.

During the thesis I developed a model to correlate companies based on their structure and financial capabilities as well as an application software using asp.net - C#, sql server 2005 to test the model with different proposed cases with different company structures and financial capabilities. The software managed to help finding a successful strategy that was used by another company. Such a system can help the requesting company to take strategic steps in the market.

For simplicity I focused on one domain field, the retailing business. Later on the model could be extended to many fields.

1.3 Research Framework

1.3.1 Main research objectives

1. To study the capability of using CBR in supporting Strategic Management.
2. To develop a model that can be used to support strategic managers.
3. To develop software that can use the developed model to help companies to select their strategies.

1.3.2 Main research questions

1. Is it possible to build a model that can describe companies?
2. Is it possible to support strategic management by software that uses that model?
3. To how far the model could be used in real life?

2. ANALYSIS OF THE THEORITICAL FRAMEWORK

2.1 Case based reasoning "CBR"

CBR can be declared also as a model of reasoning that incorporates problem solving, understanding, and learning, and integrates all of them with memory processes. These tasks are performed using typical situations called cases, already experienced by a system. (Pal and Shiu 2004, p. xvii.)

CBR can be described as the process of solving new problems based on the experience coming from similar past problems. For example: a mechanic who fixes

a car problem may remember another car that faced similar symptoms for this problem is using case-based reasoning. Or, a lawyer who advocates a particular case may base his defense on similar legal precedents. CBR in fact is a famous way of analogy making and it is not only a famous computer reasoning technique but it is also a pervasive human problem solving technique. We can notice that the use of CBR rises in the past decade as one of the powerful AI techniques.

A case may be defined as a contextualized piece of knowledge representing an experience that teaches a lesson fundamental to achieving the goals of the system (Pal and Shiu 2004, p. xvii).

It can be seen that the system becomes more efficient and more competent as a result of storing the past experience of the system and then referring to earlier cases in later reasoning. Unlike traditional knowledge based systems, a CBR system operates through a process of remembering one or a small set of concrete instances or cases and basing decisions on comparisons between the new and old situations (Pal and Shiu 2004, pp. xvii-xviii).

It has been noticed that the CBR field has appeared in a short history as one of the researches in cognitive science. During the period 1977–1993, CBR research was highly regarded as a plausible high-level model for cognitive processing.

"It was focused on problems such as how people learn a new skill and how humans generate hypotheses about new situations based on their past experiences. The objectives of these cognitive-based researches were to construct decision support systems to help people to learn" (Pal and Shiu 2004, p. 1).

2.1.1 Components, structure and features of case-based reasoning

A famous example of such a system is medical diagnosis system in which the diagnosis of new patients is based on the physician's past experience. In this situation, a case could represent a person's symptoms together with the associated treatments. When faced with a new patient, the doctor compares the person's current symptoms with those of earlier patients who had similar

symptoms. The new treatment of those new patients are depending on past treatments and may be modified, if necessary, to suit the new patient (i.e., some adaptation of previous treatment may be needed). (Pal and Shiu 2004, p. 2.)

In reality CBR paradigm as a reasoning system is used extensively by humans to find solutions in many areas such as retrieving preceding law cases for legal arguments, determining house prices based on similar information from other real estate, forecasting weather conditions based on previous weather records, and synthesizing a material production schedule from previous plans.
From the examples above we see that a case-based reasoner solves new problems by adapting solutions to older problems. (Pal and Shiu 2004. pp. 2-3.)

From the previous demonstration we can say that CBR may involve reasoning from prior examples by retaining a memory of previous problems and their solutions and then solving new problems by referencing that old experience. Generally speaking, when a case-based reasoner is presented with a problem, it will try to search its memory of past cases (called the case base) and then attempts to find a case that has the same problem specification as the case under analysis. If the reasoner cannot find an identical case in its case base, it will attempt to find a case or multiple cases that most closely match the current case. (Pal and Shiu 2004, p. 3.)

2.1.2 CBR life cycle

1. Retrieving the most similar previously experienced cases to our new case study.
2. Reusing the retrieved cases by copying them completely or by integrating the solutions of the cases retrieved.
3. Revising or adapting the solution(s) of the cases retrieved trying to solve the new problem.
4. Retaining the new solution once it has been proven that it is correct and brings successful results.
(Pal and Shiu 2004, p. 7.)

The following figure shows CBR life cycle:

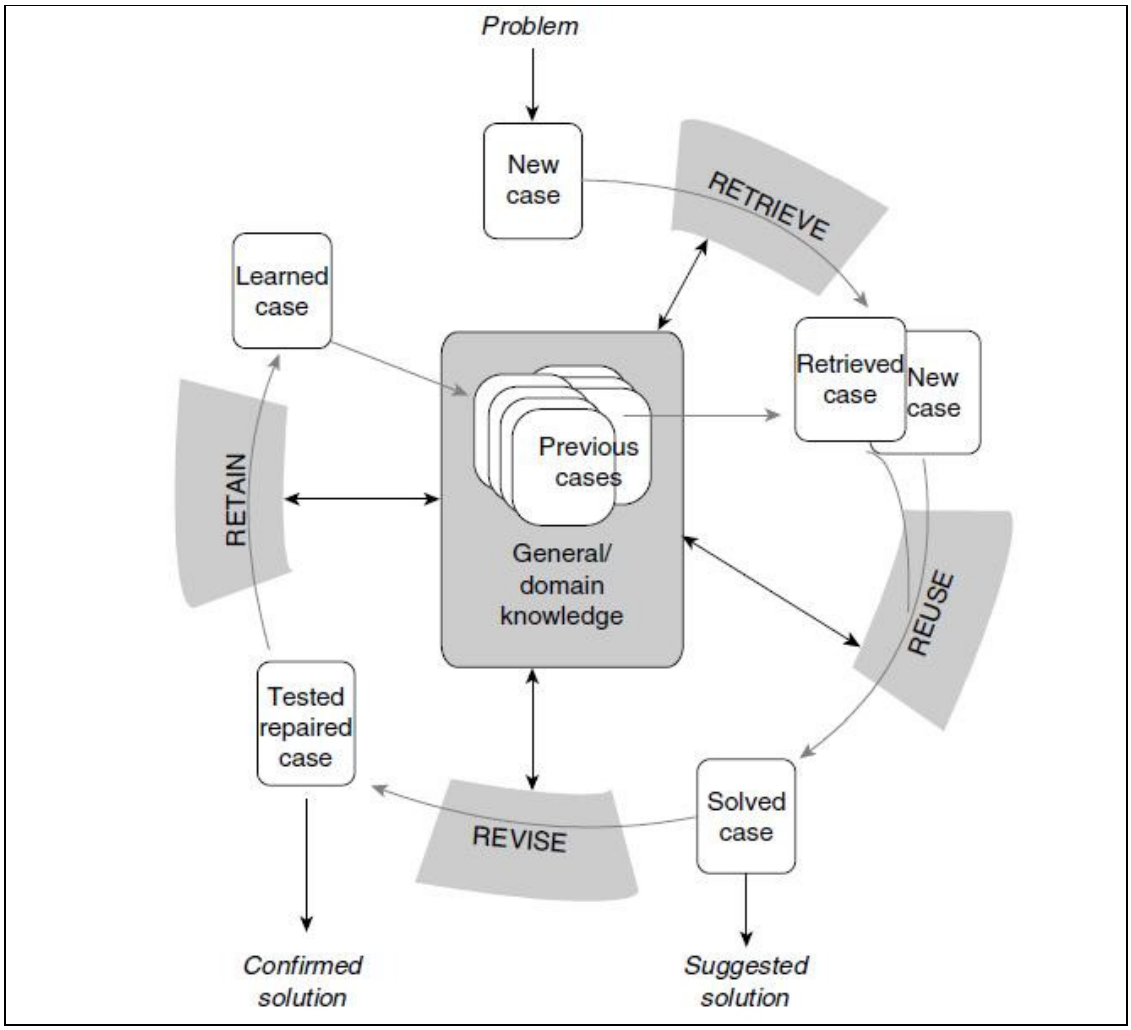

Figure 2.1 CBR cycle. (Pal and Shiu 2004, p. 6.)

2.1.3 CBR System versus Rule-Based System

In rule-based systems we have to define all rules that govern the outcomes. So we can have a set of productions in the form IF A, THEN B, where A is a condition and B is an action. If the condition A holds true, the action B is carried out and so on for all rules inside the system. Each condition can be a single premise A or a composite condition consisting of a conjunction of premises A1; A2; . . . ; An. In addition, a rule-based system has an inference engine that compares the data it holds in working memory with the condition parts of rules to determine which rules to fire, in another meaning this inference engine navigates through the decision tree till it finds the rule to be fired. (Pal and Shiu 2004, p. 4).

It is has been noticed that usually one of the most time-consuming tasks when developing rule-based systems is the knowledge acquisition task. Acquiring domain-specific information and then converting it into some formal representation can be a huge task and in some situations, when some of the domain info is not fully understood because of their complexity, formalization of the knowledge cannot be done at all (Pal and Shiu 2004, p. 4).

It can be said that case-based systems usually require significantly less knowledge acquisition, since it involves collecting a set of past experiences without the added necessity of extracting a formal domain model from these cases and hence much less effort needed. In real life, sometimes in many domains there are insufficient cases to extract a domain model, and this is another benefit of CBR: A system can be created with a small or limited amount of experience and then developed incrementally, adding more cases to the case base as they become available and that improves the result from the system (Pal and Shiu 2004, p. 5).

2.1.4 CBR versus Human Reasoning

It can be seen that the processes which make up case-based reasoning came from reflection of a particular type of human reasoning. In many situations, the problems that human beings encounter are solved with a human equivalent of CBR (Pal and Shiu 2004, p. 5).

Usually when a person encounters a new situation or problem, he or she will often try to correlate it to a past experience of a similar structure. This previous experience may be the person's experience or an experience gained by another person. If the experience originates from another person then the case will have been added to the (human) reasoner's memory through either an oral or a written account of that experience (Pal and Shiu 2004, p. 5).

It can be seen also that CBR is used in other ways, most notably as an arguing point of view. For example, some students may come to their teacher with various requests. A request might be for an extension to a deadline or for additional materials. It is a common experience of a teacher that after refusing one of these requests, to have students arguing the point. One of the common techniques that students are using is to present evidence that in another course, or with another lecturer or teacher, their request has been granted in a similar situation, with similar underlying rules. Such sort of reasoning is also very common in law domains, and illustrates another way in which case-based reasoning systems can be implemented (Pal and Shiu 2004, p. 5).

CBR can also be seen in courts when an attorney argues a point in court by references to previous cases and the precedents they set. CBR systems can refer to a case base containing court cases and find cases that have characteristics similar to those of the current one. Case similarities may be a full match or only certain points that led to a portion of the ruling. (Pal and Shiu 2004, p. 5.)

It can be concluded that the idea of CBR is intuitively appealing because it is similar to human problem solving behavior. People usually draw on past experience while solving new problems and this approach is both convenient and effective, and it often relieves the burden of in depth analysis of the problem domain. This leads to the advantage that CBR can be based on shallow knowledge and does not require significant effort in knowledge engineering when compared with other approaches (e.g., rule-based). (Pal and Shiu 2004, p. 6.)

2.1.5 Guidelines for the use of case-based reasoning

Although CBR is a useful technique for solving wide range of problems domains but there are occasions that it is not the most appropriate methodology to employ. The following questions can be used to determine whether case-based reasoning is applicable technique to solve the problem or not. (Pal and Shiu 2004. p. 9.)

1. Does the domain have an underlying model? If the domain is impossible to understand completely or if the factors leading to the success or failure of a solution cannot be modeled explicitly then CBR cannot be used (Pal and Shiu 2004, p. 9).

2. Are there exceptions and novel cases? It is advised that domains without novel or exceptional cases may be modeled better with Rule Based System where Rules could be determined inductively from past data. However, in a situation where new experiences and exceptions are encountered frequently, it would be difficult to maintain consistency among the rules in the system. Therefore, the incremental case learning characteristics of CBR systems makes it a possible alternative to rule-based systems (Pal and Shiu 2004, p. 9).

3. Do Cases recur? If the similarities between cases is very low then the experience gained may not help with the new problem because they are very different and most probably adaptation to past experience may not help much, then it is better to build the domain to derive the solution (Pal and Shiu 2004, p. 9.)

4. Is there significant benefit in adapting past solutions? We have to consider the significance for our benefit (in terms of system development time, processing effort) when making adaptation to old solutions compared with the benefit from creating a new solution for the problem from scratch.

5. Can we record data that have the necessary and relevant characteristics of past cases? Is the solution recorded in sufficient structure with ample detail so it can guide to clear suggestion, can the solution be adapted in the future for better result? (Pal and Shiu 2004, p. 9.)

2.1.6 Advantages of using case-based reasoning

1. Reducing the knowledge acquisition task by eliminating the need to extract the full model detail or the set of rules that governs that system, as it is necessary in model/rule-based systems, the knowledge acquisition tasks of CBR consists primarily of the collection of relevant existing experiences/cases and their representation and storage (Pal and Shiu 2004, p. 10).

2. Providing flexibility in knowledge modeling. When Knowledge is difficult to model or when there are incomplete date, model-based system cannot solve such problem , In contrast to that CBR using past experience as a the domain model can often provides reasonable solution to these types of problems (Pal and Shiu 2004, p. 10).

3. Used with domains that have not been fully understood, defined, or modeled. In such situation where insufficient knowledge exists to build a causal model of a domain or to derive a set of heuristics for it, a case-based reasoner can still be developed using only a small set of cases from the domain. We still can operate CBR reasoner although the full domain knowledge have not yet been understood entirely (Pal and Shiu 2004, p. 10).

4. Making predictions about how much the suggested solution may help. When there is stored information regarding the level of success of past solutions, the case-based reasoner may be able to predict the success of the solution suggested for a current problem. This is done by referring to the stored solutions, the level of success of these solutions, and the differences between the previous and current contexts of applying these solutions. Prediction could be better if the criteria for measuring success are defined especially quantitatively so the comparison could be better (Pal and Shiu 2004, p. 10).

5. Learning over time. As CBR systems are used, the system encounters more problem situations and then after creating more solutions and retaining those into the case base the experience increases and the chance for better future solutions increases. It can be said that the more cases we have in the case base the wider the future problems the system can try to solve and the better result the system can achieve (Pal and Shiu 2004, p. 10).

6. Reasoning in a domain with a small body of knowledge. We can see that in a problem domain for which only a few cases are available, CBR still can start with these few known cases and build its knowledge incrementally as cases are added. The addition of new cases will cause the system to expand in the direction of accuracy for the suggested solutions because of better close match to the problems and with more cases added in different domain fields, the system can cover wider areas (Pal and Shiu 2004, p. 10).

7. Providing a means of explanation. Case-based reasoning systems can supply a previous case and its successful solution to help convince a user of how this approach could help, or even to justify why the proposed solution could help with the current problem. In many cases there will be occasions when a user of the system wishes to be reassured about the quality of the solution provided by the system. By explaining how a previous case was successful in a situation, using the similarities between the cases conditions and the reasoning involved in adaptation, a CBR system can explain its solution to a user (Pal and Shiu 2004, p. 11).

8. CBR System can be extended to serve different purposes, because the number of ways in which a CBR system can be implemented is almost unlimited. It can be used for many purposes, such as creating a plan, making a diagnosis, and arguing a point of view. Therefore, the data dealt with by a CBR system are able to take many forms, and the retrieval and adaptation methods will also vary. Whenever stored past cases are being retrieved and adapted, case-based reasoning is said to be taking place (Pal and Shiu 2004, p. 11).

9. Ability to serve a broad range of domains, CBR can be practically applied to extremely diverse application domains (Pal and Shiu 2004, p. 11).

10. It clearly reflects human reasoning. As there are many situations where we, as humans, use a form of case-based reasoning hence it is not difficult to convince implementers, users, and managers of the validity of the paradigm. It can be seen that humans can understand CBR reasoning and explanations and if a human user is wary of the validity of an earlier solution, they are less likely to use this solution. But we have to know that the more critical the domain, the lower the chance that a past solution will be used and the greater the required level of a user's understanding and credulity (Pal and Shiu 2004, p. 11).

2.2 Strategic management

2.2.1 Definition, dimensions and process

Strategic Management can be defined as the strategy that is concerned with the match between the capabilities of the organization and its external environment. It is also influencing, shaping and creating the competitive environment. (Sierila 2003.)

Strategic Management can be also defined as a goals-oriented management in which the mission and planned achievements of an organization are clearly set out and all management processes are designed and monitored toward reaching the organization's overall goals. Steps that have already been taken to reach the goals of the organization are carefully evaluated to make sure that they have been carried out in the most efficient possible manner and that they were indeed in line with the overall goals as set forth in the mission statement which governs the strategic management process. (What is strategic management?.)

Strategic competitiveness is a type of strategy that some firms can use to achieve their organizational goals although there are many competitors around them. It can be achieved if a certain company comes out with special innovative ideas (creation of better or more effective products, processes, technologies, or ideas that are accepted by markets, governments, and society) or a new effective strategy that can allow the firm to create wealth when it is implemented. It is important when designing and implementing strategic competitiveness to select ideas and values that other companies are unable to duplicate easily or follow up with easily, and that could be realized when other competitors companies could feel that it is too costly to imitate or it is not known how the firm implemented it internally. By this, we can say that the firm has a competitive advantage.

According to Sierila, dimensions-components of strategic management are:

1-Business concept and position: a firm cannot operate in all possible businesses, so it is more natural if the firm determines its business area and this dimension is characterized by:

A-Products

B-Markets

C-Resources

D-Geographical presence in production, marketing, raw materials and energy procurement, research and development work.

2-Manufacturing and marketing chains of products: there are many activities related to this strategy dimension such as:

A-The chains in total: here there are two parameters the orchestration and the integration parameters.

B-Products/Market, Customers

C-Raw Materials

D-Technology

E-Production

F-Research and development

G-Logistics

3-Economic – Financial Dimension and it concerns the following criteria

A-Profitability (operating profit, net profit, return on investment…etc.

B-Capital structure: equity ratio

4-Human Resources and it concerns the following criteria:

A-Leadership

B-Motivation

C-Volume employment

D-Quality, skills

E-Structure, organization

F-Company structure.

5-Generic courses and it concerns the following criteria:

A-Resource-market, value added orientation

B-Flexibility

C-Efficiency, productivity, cost leadership.

D-Shift the products, the resources and/or combinations of resources

E-Differentiation

F-Focus

G-Conglomerate

H-Splitting

I-Entrepreneurship

J- Risk management.

6-Internal / external - dimension

A-Integration

B-Cluster development

C-Alliances: joint venture, licensing, fractioning, etc.

D-Outsourcing

E-Merger & acquisition: Expansion (horizontal/vertical), diversification related (concentric/conglomerate)

7-MultiCultural dimension, Internationalization

8-Social – ethical issues: social responsibilities – ecology factor which includes environment protection for water – air – solid waste, recycling life cycles. (Sierila, P. 2003, pp. 26-35.)

The strategic management process

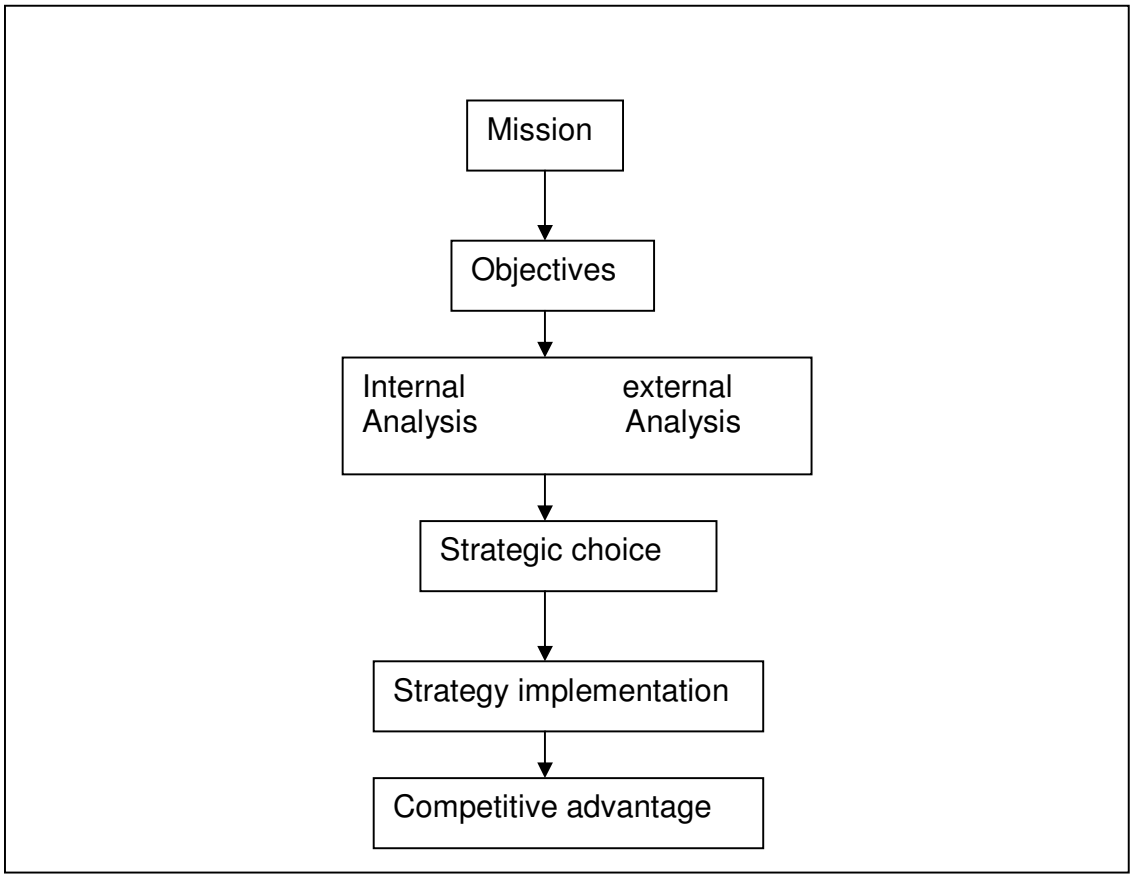

Figure 2.2 the strategic management process (Barney, Jay B. et al 2010, p.5)

As it can be seen from figure 2.2 that the main aim in strategic management is to gain competitive advantages, in fact a good strategy is the strategy that generates such advantages.

Resources and capabilities of the company could lead to competitive advantage when they are:

1. Valuable: it brings wealth or advantage to the company
2. Rare: it should be possessed only by this company or by few competitors companies.
3. Costly to imitate: other competitors cannot it in a cost effective manner.

4. Non Substitutable: it cannot be replaced by other resources-capabilities that are also comparable in cost and effectiveness.

2.2.2 Measuring competitive advantage

There are two famous measuring techniques accounting performance measures (financial measures) and economic measures (Barney, Jay B. et al 2010, pp. 13-19).

I will focus in accounting performance measures because it is easier to measure. Meanwhile there is a proportional relation between those two measuring techniques. If the firm achieved good financial-accounting measures then it also achieves good economic measures and vice versa.

2.2.3 Porter's five forces

Porter has developed his 5 forces model which is a simple but powerful tool for understanding where power lies in a business situation. It helps us to understand both the strength of the current competitive position, and the strength of a position when considering moving into it (Porter's Five Forces - Assessing the Balance of Power in a Business Situation).

It can argued that with a clear understanding of where power lies, you can take fair advantage of a situation of strength, improve a situation of weakness, and avoid taking wrong steps. Such attitudes may help in correct planning. Conventionally, the tool is used to identify whether new products, services or businesses have the potential to be profitable. However it can be very illuminating when used to

understand the balance of power in other situations. (Porter's Five Forces - Assessing the Balance of Power in a Business Situation.)

Explaining porter's five forces:
Five Forces Analysis assumes that there are five important forces that determine competitive power in a business situation.
These are:
1. Supplier Power: Here you assess how easy it is for suppliers to drive up prices. Factors that affect Supplier Power are: the number of suppliers of each key input, the uniqueness of their product or service, their strength and control over you, the cost of switching from one supplier to another, and so on. It can be clearly noticed from real life that the fewer the supplier choices you have, and the more you need suppliers' help, the more powerful your suppliers are (Porter's Five Forces - Assessing the Balance of Power in a Business Situation).

2. Buyer Power: it is concerned about how easy it is for buyers to drive prices down. This is driven by the number of buyers, the importance of each individual buyer to the business, the cost to them of switching from your products and services to those of someone else, and so on. If you deal with few, powerful buyers, then they are often able to dictate terms to you (Porter's Five Forces - Assessing the Balance of Power in a Business Situation).

3. Competitive Rivalry: the number and capability of your competitors will decide the level of the competitiveness. If you have many competitors, and they offer equally or better attractive products and services, then you'll most likely have little power in the situation, because suppliers and buyers will go dealing with others if they don't get a good deal from you. On the other side, if no-one else can do what you do, then you can often have tremendous power (Porter's Five Forces - Assessing the Balance of Power in a Business Situation).

4. Threat of Substitution: This is concerned by the ability of your customers to find a different way of doing what you do – for example, if you supply a unique software

for Strategic Management support but there are also some other software products that can do the same functionality then customers may substitute your product with other products, then this weakens your power. But if there is no substitution or the substitution is more expensive or has less criteria, then your situation is strong. (Porter's Five Forces - Assessing the Balance of Power in a Business Situation.)

5. Threat of New Entry: the ability of new competitor companies to enter your market. If it costs little in time or money to enter your market and compete effectively, if there are few economies of scale in place, or if you have little protection for your key technologies, then new competitors can quickly enter your market and weaken your position. If you have strong and durable barriers to entry, then you can preserve a favorable position and take fair advantage of it. (Porter's Five Forces - Assessing the Balance of Power in a Business Situation.)

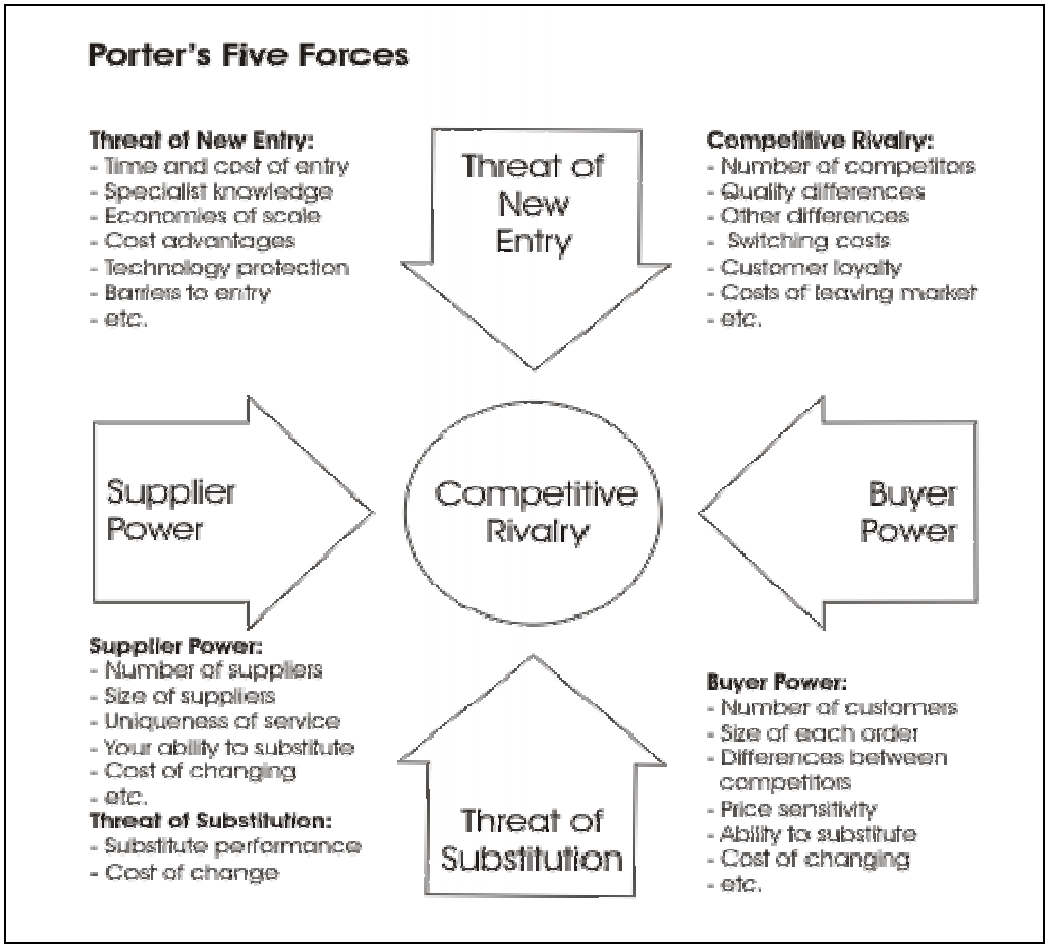

Figure 2.3 Porter's Five Forces (Porter's Five Forces - Assessing the Balance of Power in a Business Situation).

As we can see from figure 2.3, this tool was created to analyze the attractiveness and likely profitability of an industry. Since its publication, it has become one of the most important business strategy tools.

2.2.4 Porter’s generic strategies

Porter argues that if the primary determinant of a firm's profitability is the attractiveness of the industry in which it operates, yet still another important secondary determinant is its position within that industry. So even though an industry may have below-average profitability, a firm that is optimally positioned can generate superior returns (Porter’s Generic Strategies - Quick MBA Site). According to Michael Porter, a firm can position itself by leveraging its strengths. And the firm's strengths ultimately fall into one of two headings: its cost advantage and its differentiation. By applying these strengths in either a broad or narrow scope, three generic strategies result: cost leadership, differentiation, and focus. These strategies are applied at the business unit level. They are called generic strategies because they are not firm or industry dependent. (Porter’s Generic strategies - Quick MBA Site.)

Porter's Generic Strategies		
Target Scope	Advantage	
	Low Cost	Product Uniqueness
Broad(Industry Wide)	Cost Leadership Strategy	Differentiation Strategy
Narrow (Market Segment)	Focus Strategy (Low Cost)	Focus Strategy (Differentiation)

Figure 2.4 Porter's Generic Strategies (Porter's Generic Strategies - Quick MBA Site).

Strategies mentioned in figure 2.4 will discussed in the following sections.

2.2.5 Cost Leadership Strategy

We can say that this generic strategy calls for being the low cost producer in an industry for a given level of quality. So the firm by applying this strategy should sell its products either at average industry prices to earn a profit higher than that of rivals, or below the average industry prices to gain market share. In the event of a price war, the firm can maintain some profitability while the competition suffers losses. Even without a price war, as the industry matures and prices decline, the firms that can produce more cheaply will remain profitable for a longer period of time. The cost leadership strategy usually targets a broad market. (Porter's Generic strategies - Quick MBA Site.)

Firms can acquire cost advantages by improving process efficiencies, gaining unique access to a large source of lower cost materials, making optimal outsourcing and vertical integration decisions, or avoiding some costs altogether. That cost advantage due to previous criteria could be sustained if competing firms are unable to lower their costs by a similar amount. (Porter's Generic strategies - Quick MBA Site.).

Firms that succeed in cost leadership often have the following internal strengths (Porter's Generic Strategies - Quick MBA Site):

1-Access to the capital required for making a significant investment in production assets; this investment represents a barrier to entry that many firms may not overcome.

2-Skill in designing products for efficient manufacturing, for example, having a small component count to shorten the assembly process.

3-High level of expertise in manufacturing process engineering.

4-Efficient distribution channels.

We can notice that each generic strategy has its own risks, including the low-cost strategy. For example, other firms may be able to lower their costs as well. As technology improves, the competition may be able to leapfrog the production capabilities, thus eliminating the competitive advantage. Additionally, several firms following a focus strategy and targeting various narrow markets may be able to achieve an even lower cost within their segments and as a group gain significant market share. (Porter's Generic strategies - Quick MBA Site.)

2.2.6 Differentiation Strategy

It can be defined as the strategy which aims to develop products or services that offers unique attributes that are valued by customers and that customers perceive to be better than or different from the products of the competition. The value added by the uniqueness of the product may allow the firm to charge a premium price for it. The firm hopes that the higher price will more than cover the extra costs incurred in offering the unique product. Because of the product's unique attributes, if suppliers increase their prices the firm may be able to pass along the costs to its customers who cannot find substitute products easily. (Porter's Generic strategies - Quick MBA Site.)

Firms that succeed in a differentiation strategy often have the following internal strengths (Porter's Generic Strategies - Quick MBA Site):

1-Access to leading scientific research.

2-Highly skilled and creative product development team.

3-Strong sales team with the ability to successfully communicate the perceived strengths of the product.

4-Corporate reputation for quality and innovation.

But such profitable strategy has also some risks associated with it such as imitation by competitors and changes in customer tastes which could have dramatic influence on profits. Additionally, various firms pursuing focus strategies may be able to achieve even greater differentiation in their market segments (Porter's Generic Strategies - Quick MBA Site).

2.2.7 Focus Strategy

It can be noticed that a focus strategy concentrates on a narrow segment of the market and within that segment it attempts to achieve either a cost advantage or differentiation. The premise is that the needs of the group can be better serviced by focusing entirely on them. A firm using a focus strategy often enjoys a high degree of customer loyalty, and this entrenched loyalty discourages other firms from competing directly (Porter's Generic strategies - Quick MBA Site).

We can notice also that due to their narrow market focus, firms pursuing a focus strategy have lower volumes and therefore less bargaining power with their suppliers. However, firms pursuing a differentiation-focused strategy may be able to pass higher costs on to customers since close substitute products do not exist. We can notice that firms that succeed in a focus strategy are able to tailor a broad range of product development strengths to a relatively narrow market segment that they know very well. We can expect some risks of focus strategies including imitation and changes in the target segments. Furthermore, it may be fairly easy for a broad-market cost leader to adapt its product in order to compete directly. Finally,

other focusers may be able to carve out sub-segments that they can serve even better (Porter's Generic Strategies - Quick MBA Site).

2.2.8 A Combination of Generic Strategies - Stuck in the Middle?

It can be seen that generic strategies are not necessarily compatible with one another. For example if a firm attempts to achieve an advantage on all fronts, in this attempt it may achieve no advantage at all. For instance, if a firm differentiates itself by supplying very high quality products, it may risk undermining that quality if it seeks to become a cost leader. Even if it managed to get that ample quality with low price, the firm would risk projecting a confusing image. For this reason, Michael Porter argued that to be successful over the long-term, a firm must select only one of these three generic strategies. Otherwise, with more than one single generic strategy the firm may be -stuck in the middle- and may not achieve a competitive advantage. (Porter's Generic Strategies - Quick MBA Site.)

Furthermore, Porter argued that firms that are able to succeed at multiple strategies often do so by creating separate business units for each strategy. So by applying different strategies in different units it becomes possible to have different policies and even different cultures within each unit. By this approach a corporation is less likely to become "stuck in the middle." (Porter's Generic Strategies - Quick MBA Site).

However, there exists a viewpoint from real life market situations, that a single generic strategy is not always the best because within the same product, the majority of customers often seek multi-dimensional satisfactions such as a combination of quality, style, convenience, and price. There have been cases in which high quality producers, when continuing to follow a single strategy, suffered greatly when another firm in the market managed to produce products with a lower-quality but much better price, convenience, and style, and hence it meets better the overall needs of the customers. (Porter's Generic Strategies - Quick MBA Site.)

3. IMPLEMENTATION MODEL

3.1 Delimitations of our work

It is was so difficult to get up to date strategies for any company as each company hides its current strategies from competitors so it can live in the market. Finding real current strategy data for this work was almost impossible.

In strategies books there were some discussions about some cases for some old companies but they were selecting only one company from each field which cannot help us to establish a full database of company cases that have successful strategies in at least one domain field. But in exploring a corporate strategy book, there was found a case for a company in different periods where its size and financial capabilities had changed according to its new situation and hence its strategies.

After studying different strategies in different fields, I selected the criteria that can describe the structure of the company as well as the financial performance. Then I build the model and the representing strategies as if they were real using Porter's Generic Strategies and some financial performances data of the company.
The numbers used and the strategies work as a model, but the data can be substituted with real data if it is available at any time. I just tested the model and its capability to search-suggest strategies for companies.

The suggested strategies by the software cover only financial analysis – a basic structure of the company and some generic courses describing the whole strategies dimension is such an enormous job, and there is no software on the market that covers as one entity all strategies dimensions. Normally, software covers one strategy dimension only.

3.2 How I am going to link these theories?

I used Porters 5 dimensions and Porters generic strategies, as well as some of the strategies coming from examples in books on strategies, to build strategies for the company cases that will be used as a reference for suggestion to other companies. I used case based reasoning as the technique that will help to find the closest match to our current company. There is an important reason to use case based reasoning, besides of course other benefits mentioned in CBR description. When we make strategic group analysis for companies in the market, we can identify groups of business which follow similar strategies, have similar administrative systems, and tend to be affected by and respond to competitive moves and external events in similar ways (Barnat, Strategic Decision Making Aids, Strategy Maps). In CBR we can rank similarities, and by using strategic group concept, the software can suggest the closest successful strategy for that firm. The remaining part consists of statistical terms and measures that were used to analyze the financial performances of the companies to give a picture about how well the company is performing.

3.3 Why do we need to support Strategic management by software or why we need to build a DSS system to support Strategic management?

As I described in the background section, with the complexities existing current markets, and diversity of situations and strategies dimensions, the need for software that suggests some strategies for managers to help them to decide future strategies for their companies is needed. That system just gives advices, and the managers are free to select what they see that is good for their companies.

3.4 Why Rule Based System alone is not enough

Representing knowledge of a company is a very complex issue and the decision tree that could describe all possible passes of strategic management would be very complicated and unrealistic, especially with changing behaviors in the market. Also, usually in strategies there is more than one correct solution for each case. Besides that, there might be a new company case which is not identical 100% to our rules. In a Rule based system it will fail to introduce a solution, but with CBR the system is capable of introducing a solution that is close to this new case.

3.5 Model Description

3.5.1 Companies structures data

After studying companies and needed attributes to correlate companies by case based reasoning, I selected the following attributes which can reflect the company structure and its financial performance:

1. Company size (number of employees): it is important criteria to describe the company because company size most probably would affect the way it will operate and reflect its market scope.
2. Number of branches: it would affect the market scope.
2. Date of the case: This criterion is needed so I can differentiate between old and new cases. In reality, political conditions, legislation, economic trends, people's attitudes and trends towards products and technology change with time and these changes force changes in company strategies. The older the case, the less appropriate the case when applied to current companies. I have chosen that if a strategy in our registered cases is less than 30 years old, then it cannot be suggested. And the closer the company case date, the more value it can have, and the more it should be suggested.

3. Number of selling products: it has an indication for product diversification.
4. Sales volume of all products: it will indicate marketing share and the power inside the market.
5. Include online retailer capabilities: it can help companies to penetrate foreign markets as well as use diversifications with fewer risks.
6. Market share (could give weight to the importance of the firm in the market)
7. Return on assets (ROA): an indicator of how profitable a company is relative to its total assets. ROA gives an idea as to how efficient management is at using its assets to generate earnings. Calculated by dividing a company's annual earnings by its total assets, ROA is displayed as a percentage. Sometimes this is referred to as "return on investment". (Investopedia, Return On Assets – ROA.)

   The equation(3.1) for return on assets is:

$$= \frac{\text{Net Income}}{\text{Total Assets}} \qquad \textbf{(3.1)}$$

8. Threat of substitute with product
9. Supplier power
10. Buyer power
11. Entry barrier
12. Rivalry
13. Average annual turnover (revenue) for 3 years (sales) per million: it is the amount of money that a company actually receives during a specific period, usually from the sale of goods and services to customers including discounts and deductions for returned merchandise. In some countries like UK it is called the revenue (Investopedia, Revenue). Here I calculate the average for 3 consecutive years for this criterion.

14. Gross profit: it is the company revenue minus its cost of goods sold. Gross profit is a company's residual profit after selling a product or service and deducting the cost associated with its production and sale (Investopedia, Gross Profit).
Gross Profit can be calculated by equation 3.2

Gross profit = Net sales – Cost of goods sold	(3.2)

15. Operating costs: it includes

- Accounting expenses
- License fees
- Maintenance and repairs, such as snow removal, trash removal, janitorial service, pest control, and lawn care
- Advertising
- Office expenses
- Supplies
- Attorney fees and legal fees
- Utilities, such as telephone
- Insurance
- Property management, including a resident manager
- Property taxes
- Travel and vehicle expenses

16. Interest: it is either the charge for the privilege of borrowing money, typically expressed as an annual percentage rate as it is most commonly or the amount of ownership a stockholder has in a company, usually expressed as a percentage (Investopedia, Interest**)**.When money is borrowed, interest is typically paid to the lender as a percentage of the principal, the amount owed. The percentage of the principal that is paid as a fee over a certain period of time (typically one month or year), is called the interest rate. A bank deposit will gain interest because the bank

is paying for the use of the deposited funds. Assets that are sometimes lent with interest include money, shares, consumer goods, major assets such as aircraft, and even entire factories depending on arrangements and agreement. The interest is calculated upon the value of the assets in the same manner as upon money.

17. Taxes

18.

Earnings before interest and taxes EBIT: it is net income with interest, taxes and it is an indicator of a company's profitability, calculated as revenue minus expenses , excluding tax and interest. EBIT is also referred to as operating earnings, operating profit and operating income (Investopedia, EBIT).

EBIT = Revenue – Operating expenses (OPEX) + Non operating income	(3.3)

EBIT can be calculated by equation 3.3

19.

Net Income = Gross profit – Total operating expenses – taxes – interest	(3.4)

Net Income can be calculated by equation 3.4

3.5.2 Model Calculation:

Each company can be represented by the previous criteria. I defined a total company value which describes the company as a total. Each criterion has a value and also a normalization value and a weight value. The reason for normalization value is to move the numbers in a coordinated accepted range way. For example, some criterion like sales volume will be sometimes per millions of units which will lead the total value to move far away, so I needed to keep the participation of different factors in acceptable comparable ranges coming from practical experience of viewing the average value of each criterion. The reason of weight

factor is to define different importance participation for each criterion, for example, some criteria are very important so they get a 10, while others could be less. The range of this factor is from 1 to 10.

This total value is calculated by equation (3.5):

$$\text{Total Value} = \left[\sum_{i=0}^{n} (xi * Wi) / Ni \right] + \text{DValue} + \text{OnlineRetailerValue} \qquad (3.5)$$

- Where X is the criterion value
- N normalization factor
- W weight factor
- n total number of factors without date parameter and online retailer parameter.
- D date difference per year of the case with the current date.
- DValue = getDateValueFunction
- OnlineRetailerValue = getOnlineRetailerFunction

Online retailer value calculation is as follows

```
if(case.OnlineRetailer == true)
        totalValue += 10;
```

If online Capability exists then total company value increases by 10. Otherwise they get zero participation in this part.

```
int yearDiff = DateTime.Now.Year - c.DateOfTheCase.Year;
    if (yearDiff >= 0 & yearDiff <= 3)
       totalValue += 10;
    else if (yearDiff >= 4 & yearDiff <= 6)
       totalValue += 9;
    else if (yearDiff >= 7 & yearDiff <= 9)
       totalValue += 8;
    else if (yearDiff >= 10 & yearDiff <= 12)
```

```
    totalValue += 7;
else if (yearDiff >= 13 & yearDiff <= 15)
    totalValue += 6;
else if (yearDiff >= 16 & yearDiff <= 18)
    totalValue += 5;
else if (yearDiff >= 19 & yearDiff <= 21)
    totalValue += 4;
else if (yearDiff >= 22 & yearDiff <= 24)
    totalValue += 3;
else if (yearDiff >= 25 & yearDiff <= 27)
    totalValue += 2;
else if (yearDiff >= 28 & yearDiff <= 30)
    totalValue += 1;
else
    return 0;
```

In the date of the case criterion, I noticed that with time the political situations-events, economic theories, technology, and many other issues changed which affected the strategies. In other words, old successful strategies for some companies may not be applicable to new company cases.

If the registered-reference case is 0 to 3 years from the current case, then it gets 10 points, but if it is 3 to 6 years old, then it gets 9 points. With each 3 years difference over 3 years, I decrease the value which participates in total value calculations.

If the registered-reference case is more than 30 years old, then such a case could not participate in the model and the total returned value for the company is zero.

I compare total Values between all cases and our case by Euclidian distance.

The system will calculate the difference in percentage between these cases and our case, and then make a rank for the closest case first, then the next closest, and so on. The users would be able to browse the cases and see their strategies and select what they find it suitable for their company.

There is another feature that makes the example of financial analysis of our company compared to the average of other companies registered in the system, which helps to know the financial performance of the company.

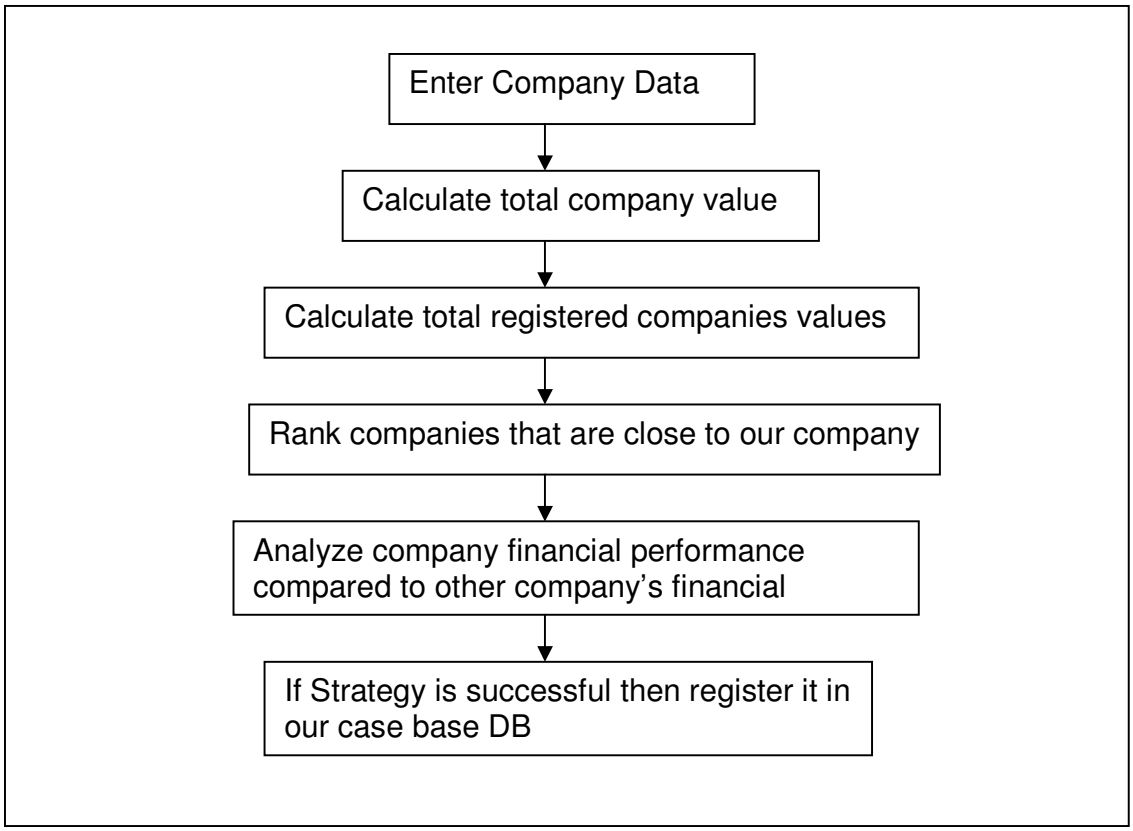

Figure 3.1 program steps sequence

From Figure 3.1 we can see the sequence of using the software.

Description of some financial analysis data that is used in the implementation:

1-Average Annual Turnover per Employees For all Registered Cases:
This shows how much each employee would participate in total revenue.
It can be calculated from equation 3.6

$$a1 = \left[\sum_{i=0}^{n} xi / N \right] / n \qquad (3.6)$$

Where n is number of registered cases
X is the annual turnover for a certain company
N is the company size or number of employees for a certain company

I compare this average with annual turnover of the new case and then I can see how far this value is good or bad compared to the average.

2-Average Annual Turnover per Number of branches for all Registered Cases:
This criterion shows how much the company branches are effective in participation in total revenue. For example some companies have fewer branches but they gain more money from them while others have more branches but they produce less revenue from each branch.

It can be calculated from equation 3.7

$$a2 = \left[\sum_{i=0}^{n} xi / Ni \right] / n \qquad (3.7)$$

Where n is number of registered cases
X is the annual turnover for a certain company

N is number of branches for certain company

3-Average Gross Profit to average Annual Turn Over for all Registered Cases
This criterion shows the profit of the products excluding costs of the product including taxes, interest and operation costs of certain company compared to other companies.

Normally a company with a high ratio on this criterion is specialized in selling expensive unique products with large profit, and a low ratio means cheap products with few profits.

It can be calculated from equation 3.8

$$a3 = \left[\sum_{i=0}^{n} gi / ti \right] / n \qquad (3.8)$$

Where n is number of registered cases
g is the gross margin for a certain company
t is annual turnover for certain company

4-Average Interest to EBIT For all Registered Cases: It is a measure of how much seriousness the loans a company has borrowed compared to the EBIT of the company. The higher the ratio, the worse the situation of the company, and the lower, the better.

It can be calculated from equation 3.9

$$a4 = \left[\sum_{i=0}^{n} Ii / Ni \right] / n \qquad (3.9)$$

Where n is number of registered cases
I is the Interest for a certain company
N is EBIT for certain company

5-Average Taxes to EBIT For all Registered Cases: It measures how taxes are high in that country and in that industry field.

It can be calculated from equation 3.10

$$a5 = \left[\sum_{i=0}^{n} ti / Ni \right] / n \qquad (3.10)$$

Where n is number of registered cases
t is the amount Taxes for a certain company in a year
N is EBIT for certain company

6-Average Operating Costs to Gross Profit For all Registered Cases: it measures the weight of operating cost to gross profit, and certainly high value means the company should notice that it loses money due to high operating costs.

It can be calculated from equation 3.11

$$a6 = \left[\sum_{i=0}^{n} Oi / Gi \right] / n \qquad (3.11)$$

Where n is number of registered cases
O is the operating costs for a certain company in a year

G is gross profit for certain company

3.6 Result discussion:

3.6.1 Data preparation:

I prepared 5 different cases for virtual companies with random structure. Then I built strategies for them using Porter's Five Forces and Porter's generic strategies as well as some strategies that were written in exploring a corporate strategy text and cases book. These companies would be our base companies which I will refer to when suggesting strategies to other companies similar in structure.

I prepared also three different random virtual test companies to search for strategies for them.
The software will ask about the company structure for which I wish to search for a strategy, and after I select this company the system will search for the best close company to this company from our case base of 5 companies. Then it shows us the suggested strategy and makes some financial analysis for the test company that gives their managers information about some strengths and weaknesses in the company.

3.6.2 Example 1:

Figure 3.2 shows the first virtual test company that has the following structure:

Company Size	125
Number of branches	15
Date Of The Case	6/7/2011
Number Of Selling Products	2,500
Sales Volume Average Per Two Years	200,000
Online Retailer cabability	True
Market Share	6.00 %
Return On Assets	10.00 %
Threat Of Substitute	50.00 %
Supplier Power	20.00 %
Buyer Power	20.00 %
Entery Barrier	20.00 %
Rivalary	85.00 %
Average Annual Turnover	$6,000,000.00
Gross Profit	$1,000,000.00
Operating Costs	$600,000.00
Earnings Before Interest And Taxes	$400,000.00
Intersts	$100,000.00
Taxes	$100,000.00
Net Income	$200,000.00

Figure 3.2 virtual test company 1

We get the following result as in Figure 3.3:

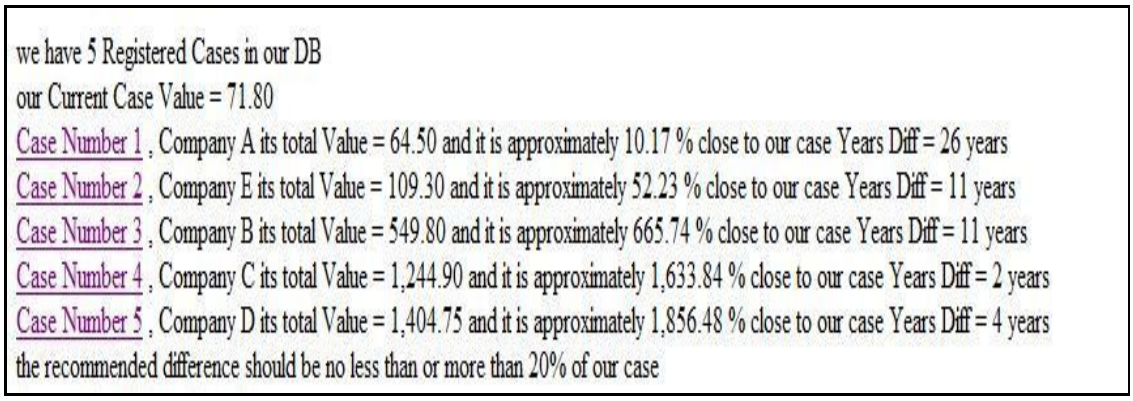

Figure 3.3 Case base correlations with our test Case

The system ranked the registered companies according to the closest first, then the next one, and so on. The system calculates the percentage of company differences. For example, Company A is different from the test company by just 10.17 %. I can measure these similarities by comparing the total values of the companies. Equation 3.12 shows how this calculation is conducted.

$$\text{Companies difference} = \frac{\text{Math.Abs(ourTestCaseTotalValue - RegisteredCompanyTotalValue)}}{\text{ourTestCaseTotalValue}} \quad \textbf{(3.12)}$$

The system shows us how old the registered case is, which gives us an idea about whether or not the suggested solution is old or still applicable. If it is less than 30 years, then the case completely will have total value equal to zero and will not be considered in our calculations.

From this page we can click on the first link which represents company A to view its structure and the strategies which will be suggested to us.

Company Name	Company A
Company Size	100
Number of branches	10
Date Of The Case	2/2/1985
Number Of Selling Products	1,000
Sales Volume Average Per Two Years	100,000
Online Retailer cabability	False
Market Share	5.00 %
Return On Assets	20.00 %
Threat Of Substitute	70.00 %
Supplier Power	10.00 %
Buyer Power	10.00 %
Entery Barrier	10.00 %
Rivalary	80.00 %
Average Annual Turnover	$7,000,000.00
Gross Profit	$1,500,000.00
Operating Costs	$600,000.00
Earnings Before Interest And Taxes	$900,000.00
Intersts	$100,000.00
Taxes	$300,000.00
Net Income	$500,000.00

Figure 3.4 the closest case structure

From this Figure (3.4) we can see the structure of the first closest company, and in the same page downside we can see the successful strategy applied by this company as in figure 3.5.

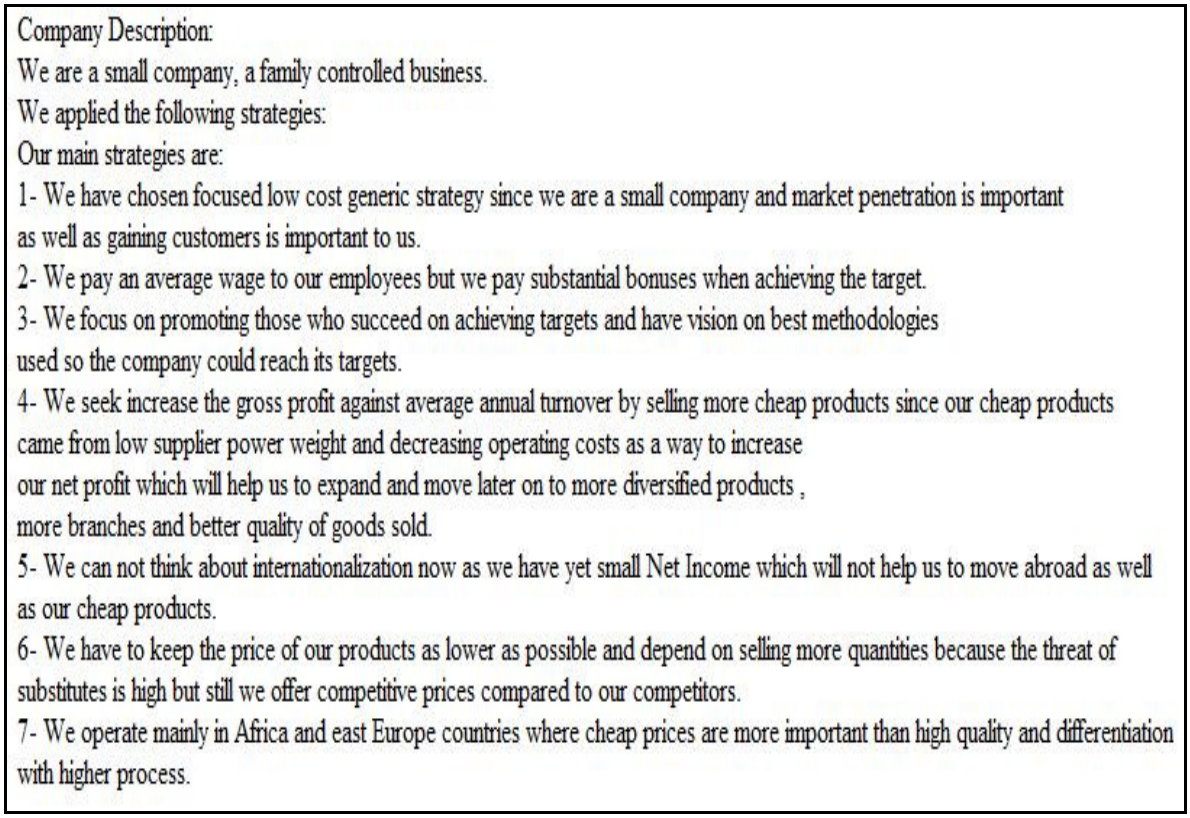

Figure 3.5 the closest case strategy

The user can navigate the two or three closest companies, not only the first one, and select a mixture for their strategy.

At the end of the page of the company analysis there is a part that makes small financial analyses of the test company to help mangers to compare the performance of their companies with the average performance of other companies.

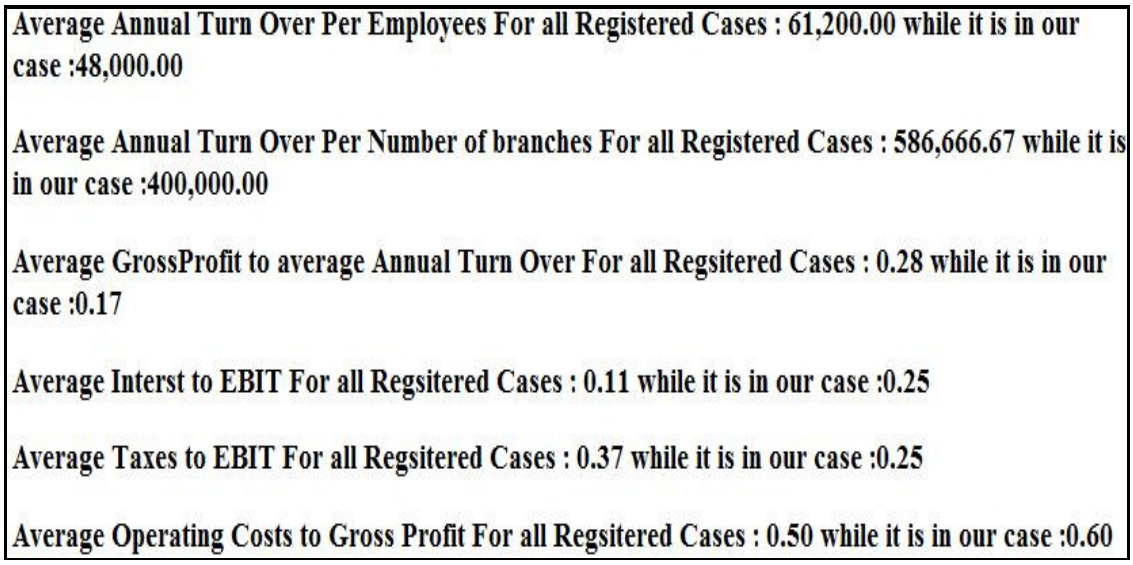

Figure 3.6 Virtual test case financial analyses

As we can see from the figure 3.6:
1-the average turnover per Employees for all registered cases is higher than our test company which means the participation of each employee in our test company in total revenue is less than the average participation. That could imply less overall revenue or may be due to selling inexpensive products with fewer profits or excess employee usage.

2-the average annual turnover per number of branches is also higher which means that branch participation in total revenue is also less, maybe to more branches than needed for the sales volume, or for fewer overall revenue.

3-average gross profit to average annual turnover is considered low compared to the average for all registered companies which indicates that the company sells inexpensive products compared to other companies.

4-the Interest to EBIT for the test company is very high compared to the average of all companies which means they either borrowed large amounts of money, or the Interest rate is very high in this country or both together. The company has to decrease its loans or face a severe situation in the future.

5-the taxes to EBIT for the test company is less than the average which is considered a good sign which may indicate that the country where the work has acceptable tax laws.

6- The operating cost to gross profit for the test company is higher than the average which indicates that their operational costs are high and they have to decrease it.

3.6.3 Example 2:

With the second virtual test company, seen in figure 3.7, we can see the following company structure:

Company Size	800
Number of branches	75
Date Of The Case	6/7/2011
Number Of Selling Products	10,500
Sales Volume Average Per Two Years	1,500,000
Online Retailer cabability	False
Market Share	17.00 %
Return On Assets	15.00 %
Threat Of Substitute	50.00 %
Supplier Power	60.00 %
Buyer Power	20.00 %
Entery Barrier	20.00 %
Rivalary	85.00 %
Average Annual Turnover	$100,000,000.00
Gross Profit	$25,000,000.00
Operating Costs	$18,000,000.00
Earnings Before Interest And Taxes	$7,000,000.00
Intersts	$1,000,000.00
Taxes	$4,000,000.00
Net Income	$2,000,000.00

Figure 3.7 Virtual test company 2

When we try to search for a close match we get the following results as in Figure 3.8.

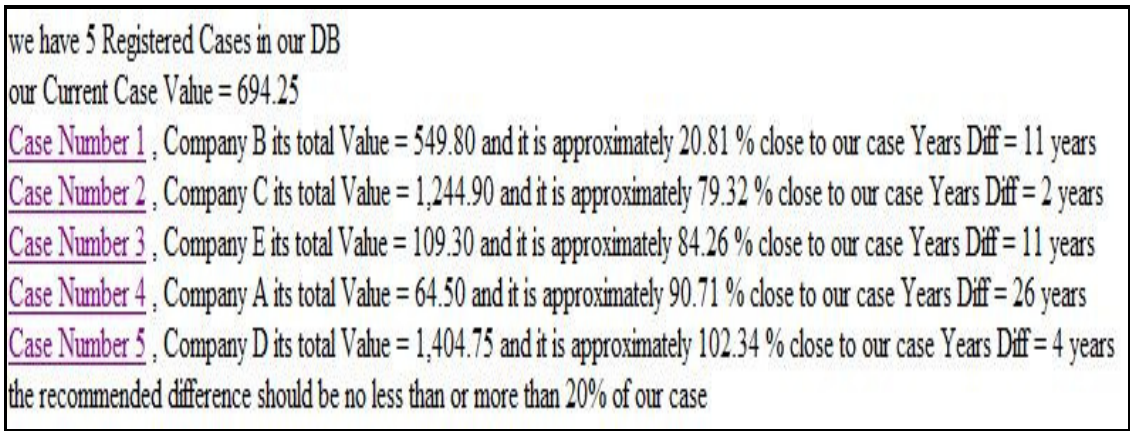

Figure 3.8 Case base correlations with our test Case

The system ranked the registered companies according to the closest first, then the next, and so on. The system calculates the percentage of companies' differences. For example, Company B is just different than the Test Company by 20.81 %. We can measure these similarities by comparing the total values of the companies.

One note here, although company B is the closest company to our test company, the difference is more than 20% which may mean that part of the strategies may not be suitable for the test company.

From this page we can click on the first link which represents company B to view its structure and its strategies which will be suggested to us.
Figure 3.9 shows the suggested Close company structure.

Company Name	Company B
Company Size	1,000
Number of branches	100
Date Of The Case	2/2/2000
Number Of Selling Products	10,000
Sales Volume Average Per Two Years	1,000,000
Online Retailer cabability	True
Market Share	15.00 %
Return On Assets	10.00 %
Threat Of Substitute	20.00 %
Supplier Power	80.00 %
Buyer Power	10.00 %
Entery Barrier	20.00 %
Rivalary	80.00 %
Average Annual Turnover	$80,000,000.00
Gross Profit	$20,000,000.00
Operating Costs	$10,000,000.00
Earnings Before Interest And Taxes	$6,400,000.00
Intersts	$1,000,000.00
Taxes	$4,000,000.00
Net Income	$5,000,000.00

Figure 3.9 the closest case structure

From Figure 3.9 we can see the structure of the first closest company.
And on the same page downside we can see the successful strategy applied by this company as in figure 3.10.

Company Description:
We are a upper medium going to be large company, a joint stock company.
We applied the following strategies:
1-We have chosen focused, differentiation generic strategy since we are a medium size company which operates in west Europe and product quality is important to keep our customers with us.
2- Since the Rivalry is very high then we selected to be focused on certain segments of products but we offer them in high quality and unique features.
3-we depend on the shifting costs of our products is high and our product is needed to serve certain segment of the customer which makes the buyer power low and helps us to keep the prices in profitable positions.
4-we offer online reseller capability which helps us to move forward in the international market as well as facilitate selling without need to come to any of our branches which will help us to scale selling capabilities.
5-we aim to increase in size and serve more customer segments and move into complete differentiation strategy but we have first to move step by step by adding new unique products and opening new branches.

Figure 3.10 the closest case strategy

The user can navigate the two or three closest companies not only the first one and select a mixture of their strategies.

The financial analysis part for this test company is:

Average Annual Turn Over Per Employees For all Registered Cases : 61,200.00 while it is in our case :125,000.00

Average Annual Turn Over Per Number of branches For all Registered Cases : 586,666.67 while it is in our case :1,333,333.33

Average GrossProfit to average Annual Turn Over For all Regsitered Cases : 0.28 while it is in our case :0.30

Average Interst to EBIT For all Regsitered Cases : 0.11 while it is in our case :0.17

Average Taxes to EBIT For all Regsitered Cases : 0.37 while it is in our case :0.33

Average Operating Costs to Gross Profit For all Regsitered Cases : 0.50 while it is in our case :0.60

Figure 3.11 Virtual test case financial analyses

As we can see from Figure 3.11:

1-the turnover per Employees in our test company is considerably higher than the average turnover per employees for all companies which means either effective usage of employees in production or large profits because of selling expensive differentiated products or both.

2- The Annual turnover per number of branches is higher also which means that branch participation in total revenue is also higher which means effective usage of branches.

If those two previous parameters are good then it means that the company gains good profit from selling its products.

3- The Gross profit to annual turnover in our test company is considered higher compared to the average for all registered companies which indicates that the company sells expensive differentiated products compared to other companies.

4- The Interest to EBIT for the test company is higher than the average of all companies which means the test company either borrowed large amounts of money or the interest rate in this country is high or both. The company has to decrease its loans otherwise it will face a severe situation in the future.

5-the taxes to EBIT for the test company is less than the average which is considered a good sign which may indicate that the country they work in offers acceptable tax laws.

6- The operating cost to gross profit for the test company is higher than the average which means they earn more money in operations. They have to cut down this high operational cost by studying the reason for this. Is it high wages? Do they waste resource usage? Do they rent in expensive places? etc.

3.6.4 Example 3:

With the third virtual test company that has the following structure as in Figure 3.12:

Company Size	10,000
Number of branches	500
Date Of The Case	6/8/2011
Number Of Selling Products	20,500
Sales Volume Average Per Two Years	20,000,000
Online Retailer cabability	False
Market Share	25.00 %
Return On Assets	15.00 %
Threat Of Substitute	30.00 %
Supplier Power	90.00 %
Buyer Power	25.00 %
Entery Barrier	90.00 %
Rivalary	80.00 %
Average Annual Turnover	$150,000,000.00
Gross Profit	$40,000,000.00
Operating Costs	$20,000,000.00
Earnings Before Interest And Taxes	$20,000,000.00
Intersts	$2,000,000.00
Taxes	$10,000,000.00
Net Income	$8,000,000.00

Figure 3.12 virtual test company 3

When we try to search for a close match we get the following results.

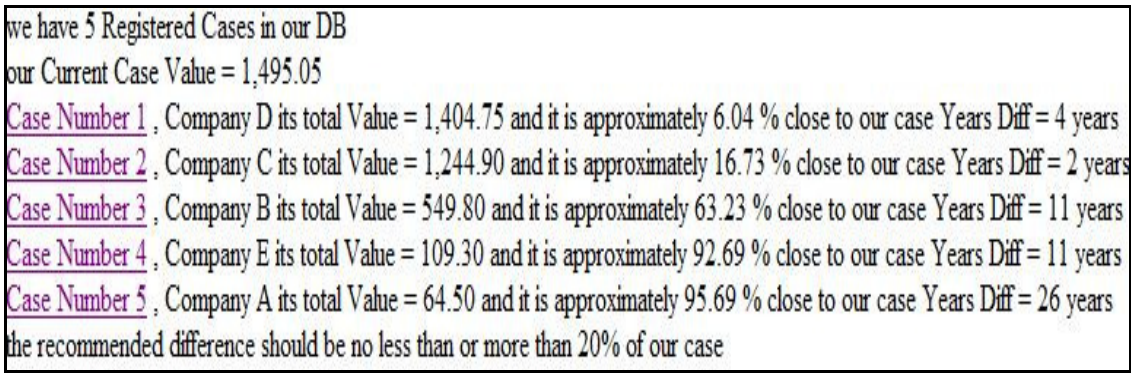

Figure 3.13 Case base correlations with our test Case

In this case as we can see in figure 3.13 we have two close cases, company D and company C.

The user can view both registered cases and select a mixture of their strategies.

Company D Structure:

Company Name	Company D
Company Size	2,500
Number of branches	300
Date Of The Case	2/2/2007
Number Of Selling Products	13,000
Sales Volume Average Per Two Years	9,000,000
Online Retailer cabability	True
Market Share	20.00 %
Return On Assets	25.00 %
Threat Of Substitute	5.00 %
Supplier Power	90.00 %
Buyer Power	5.00 %
Entery Barrier	60.00 %
Rivalary	30.00 %
Average Annual Turnover	$140,000,000.00
Gross Profit	$50,000,000.00
Operating Costs	$30,000,000.00
Earnings Before Interest And Taxes	$20,000,000.00
Intersts	$2,000,000.00
Taxes	$6,000,000.00
Net Income	$12,000,000.00

Figure 3.13 shows the closest case to our test case.

Company D strategies are as in figure 3.14:

Company Description:
We are a big company with considerable market share.
We applied the following strategies:
1. we are a big company that focuses on selling luxury products and hence We have chosen differentiation focused generic strategy where we wished to cover a certain customer segments with outstanding products that they need.
2. As long as the switching costs of our products are high and we offer unique needed products the buyer will continue to have less power against us. But we have to be very careful from supplier power since we depend mainly on high quality products that they produce.
3. we offer online reseller capability which helps us to move forward in the international market as well as facilitate selling without need to come to any of our branches which will help us to scale selling capabilities.
4. we do not think about other areas of generic model, since we are successful in our arena and the ROA is high, there is no need to change the current successful specialization strategy.
5. our future aim is to reduce substantially the dependence on a high level of bank borrowing as our interest is high and it may increase with years if we did not control it.
6. we have good brand name in selling high quality products and we have to keep our marketing campaign to support our future productions.
7. we have to keep being the first choice for customers who wish to find high quality products easily,
8. we have high operational costs since we hire the best calibers in the market and pay the highest incentives to our employees as well as we use the highest technologies in our stores. We should decrease operational costs as much as we can without affecting employees motivations or decreasing the quality of our services by increasing sales, control costs and improve margins.

Figure 3.14 the closest case strategy for first case

Also Company C could be suggested where it has the following structure as in figure 3.15.

Company Name	Company C
Company Size	3,000
Number of branches	500
Date Of The Case	2/2/2009
Number Of Selling Products	15,000
Sales Volume Average Per Two Years	10,000,000
Online Retailer cabability	True
Market Share	30.00 %
Return On Assets	20.00 %
Threat Of Substitute	20.00 %
Supplier Power	80.00 %
Buyer Power	35.00 %
Entery Barrier	50.00 %
Rivalary	80.00 %
Average Annual Turnover	$150,000,000.00
Gross Profit	$40,000,000.00
Operating Costs	$20,000,000.00
Earnings Before Interest And Taxes	$20,000,000.00
Intersts	$2,000,000.00
Taxes	$8,000,000.00
Net Income	$10,000,000.00

Figure 3.15 the closest case structure number 2

We can see in the page downside Company C strategies as can be seen from figure 3.16:

We are a big company with considerable market share.
We applied the following strategies:
1-We have chosen differentiation generic as well as cost leadership strategy, we wished to cover broad customer segments with different desires .since we are a big size company which operates in Nordic and north Europe, product quality is important to keep our customers with us specially in Nordic countries area. But also we apply cost leadership strategy to cover areas from our customs like students and low level workers which will help us to increase our market share.
2- Since the Rivalry is very high then when selecting two strategies (cost leadership and differentiation) it means we are able to increase our profits by covering more customer segments.
3-we depend on the shifting costs of our products is high for the differentiation products and those product are needed to serve certain segments of customers which makes the buyer power low and helps us to keep the prices in profitable positions. As well as cost leadership products helps us to be always needed by customers from many segments.
4-we offer online reseller capability which helps us to move forward in the international market as well as facilitate selling without need to come to any of our branches which will help us to scale selling capabilities.
5-our future aim is to increase our market share and trying to cover more customer segments.
6-our future aim is to reduce substantially the dependence on a high level of bank borrowing as our interest is high and it may increase with years if we did not control it.
7-we have to follow strong wide marketing campaigns to keep telling customers about us and to tell about new products.
8-we have to keep being the first choice for customers who wish to find any products easily, since we offer the widest products types then in one trip a customer can buy all what he/she needs which is different than other competitors where a customer needs to make a visit for each store that covers only certain segment of products.
9-we have high operational costs since we hire the best calibers in the market and pay the highest incentives to our employees as well as we use the highest technologies in our stores.
We should decrease operational costs as much as we can without affecting employees motivations or decreasing the quality of our services by increasing sales, control costs and improve margins.

Figure 3.16 the closest case strategy number 2

The test company 3 financial analyses can be seen in figure 3.17:

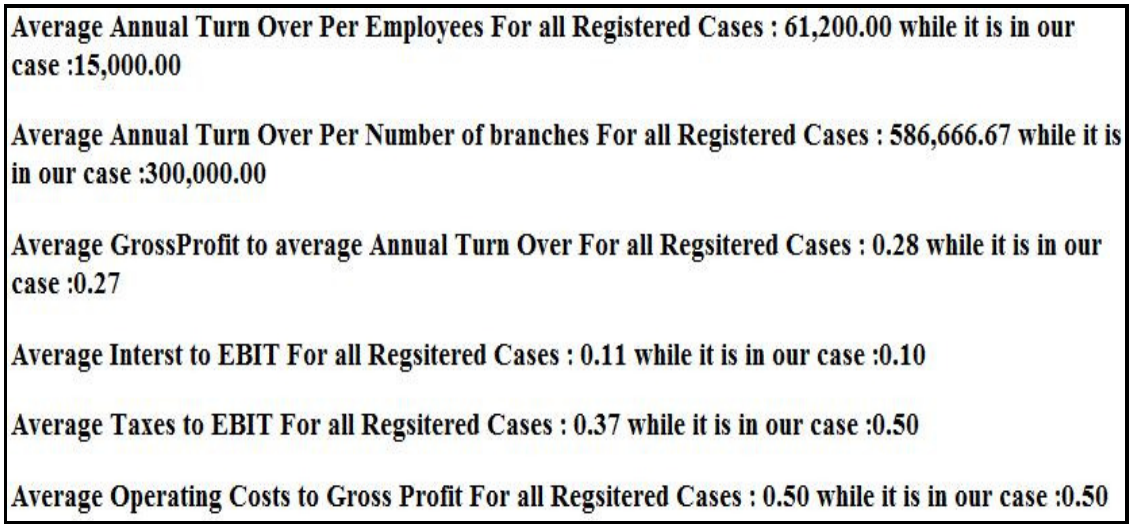

Figure 3.17 Virtual test case financial analyses

As we can see from figure 3.17:
1-the turnover per Employees in our test company is considerably less than the average turnover per employees for all companies which means either great ineffective usage of employees in production or fewer profits because of selling very cheap products or both.

2- Annual turnover per number of branches is less, which also means that branch participation in total revenue is also less which might be due to ineffective usage of branches or less revenue.

3- Gross profit to annual turnover in our test company is almost the same as the average which means they sell products at the average price like companies in the market.

4- The Interest to EBIT for the test company is almost the same as the average for all companies which means that they either borrow money in an acceptable range or the Interest rates in this country are moderate, or both.

5-the taxes to EBIT for the test company is higher than the average which is considered a bad sign which may indicate that the country where they work imposes high taxes.

6- The operating cost to gross profit for the test company is the same as the average which shows that their operations costs as a total are in an acceptable range, but when I refer to point number 1 and 2 in this analysis, we are sure now that there is a problem in the number of employees. They are using an excess number of employees for the unit of tasks, or they use insufficient work flow that forces them to use more workers.
They have a very good usage of other operation costs that balance this problem; this is why we see the value of this analysis is almost the same as the average. But we recommend strongly that the company should investigate the problem of its labor usage, work flow, and technology used because the higher the technology used, the less labor is needed.

4. SUMMARY AND CONCLUSION

Every day we can see more and more applications for Artificial Intelligence in our lives, we need to give machines and computers the ability to think and to respond according to the situation. We cannot handle everything manually, so automation of procedures are becoming more important each day, especially when we lack adequate numbers of workers or experts, or if we wish to reduce the cost, labor effort, and time of production with a stable standard of production.

IT and business become more and more connected topics nowadays as modern businesses cannot work efficiently without adequate IT systems to serve them. However, computers cannot think. Although IT can serve all fields, at certain points we need some parts that are intelligent enough to respond correctly according to different situations and hence with time we begin to see the rise of the usage of Artificial Intelligence techniques inside IT systems so they respond intelligently as if we have an expert responding.

Commercially there are many software programs that begin using artificial intelligence techniques for cleverer and better results. The Google search engine is one of these, a very famous tool that everybody uses every day. In Business fields there are many artificial Intelligence software programs on the market.

Since I am specialized in IT, Artificial Intelligence, and International Business Management, I thought that I could connect those fields by studying the capability of supporting strategic management by software. I tried to solve the problem of lacking an adequate number of strategic managers in companies. And after studying different Artificial Intelligence techniques I have selected Case Based Reasoning as my way to realize my idea.

Case based reasoning is a powerful technique that can be used to support strategic management and it does not need to have huge cases to begin working. The system could launch with fewer cases and increase its experience and efficiency with time. With this technique we need not have strong domain knowledge.

To be able to use CBR and to test its applicability, I needed to build the model that can use CBR and then implement that model in practice. After putting rules for the system and building the model I passed through the phase of implementing it as software so we can see how applicable it can be. I can say that the model developed is much easier than the Rules based systems, but of course the more cases we have the better the match that we could find and the better the strategy we could recommend.

I have faced the problem of finding adequate numbers of real cases to implement my model as companies do not like to reveal current strategy, and strategy books do not have enough cases for one domain field so I might begin my testing with real data. As a result, I have used hypothetical data to prove my deductions. In real life we can replace this hypothetical data with real data.

I think I managed to answer the research questions during my research by building the model and implementing it, and then testing its result. However, I believe that the future of usage of such software would depend on having real company cases as well as applying hybrid systems that use Case based reasoning with other AI techniques which may increase the efficiency of the system. We can at run time modify the recommended cases and try to measure these new generated cases, and even invent new solutions from old cases that suit companies better. The software covers only some dimensions in Strategic Management, but for future usage it can be extended to all dimensions. One bridge for the data obstacle is through some kind of practical business cooperation with a consulting company that provides consultation to companies about their strategies. That approach may help to provide the necessary data.

It was quite interesting for me to connect IT & Artificial Intelligence & strategic management and I have learned many interesting concepts in strategic management. I think the future in science is for interdisciplinary scientific cooperation where we can see applications using more than one scientific branch.

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